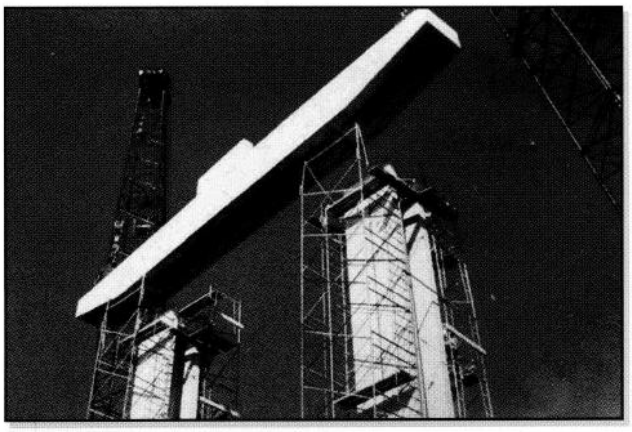
U.S. Department of Transportation
Federal Highway Administration

Priority, Market-Ready Technologies and Innovations

Prefabricated Bridge Elements and Systems

Problem: Bridge construction is a primary source of congestion

The traveling public has lost patience with the extensive highway construction that is necessary today. As the U.S. interstate highway system approaches the end of its service life, urban congestion continues to grow. Bridge construction or rehabilitation can be a significant source of congestion because of its sequential nature: foundations for piers and abutments must be built first, then pier columns and caps must be built before beams and decks are placed. Offsite prefabrication technologies and processes help solve this problem.



Prefabricated superstructure caps and columns

Solution: Prefabrication minimizes traffic disruptions

Prefabricated bridge elements can be manufactured either onsite or offsite under controlled conditions and brought to the construction location, ready for installation. Using prefabricated elements and systems minimizes construction-related traffic disruptions, increases work zone safety by reducing the number of and exposure time of workers operating near moving traffic, reduces environmental impacts by minimizing the site access footprint, and improves the constructability of bridge designs by controlling manufacturing environments. Innovative concepts including use of high performance materials can mitigate the frequent need for maintenance and resulting traffic impacts.

Substructures

A total substructure system consists of individual pier(s) or prefabricated bent cap supported by precast column(s).

Bent and Pier Caps

Cast-in-place bent and pier caps require extensive formwork and curing times, but if they are fabricated offsite, curing times are not a factor. As a result, bridge owners and contractors increasingly are turning to precast caps. Precast caps provide the following benefits:

- For over-water bridges, they reduce the amount of time that workers need to operate over water.
- For bridges over existing roadways, they minimize formwork required, which reduces traffic disruption on the lower roadway.
- For bridges with job site constraints, such as power lines that affect work zone safety, they limit the amount of time that workers are at risk.

Columns

Bridge construction times can be reduced significantly by using precast columns. Columns can be segmented, post-tensioned, reinforced, hollow, or solid concrete.

Superstructures

Increasingly, innovative bridge designers and builders are finding ways to prefabricate entire segments of the superstructure. This may involve prefabricated truss spans and preconstructed composite units that are fabricated or assembled at or away from the project site and then lifted into place in one operation.

Decks

Prefabrication offers exceptional advantages for deck construction, particularly for removing deck construction from the critical path of bridge construction schedules. Partial-depth prefabricated deck panels act as stay-in-place forms that help accelerate and control construction for decks that are more durable than fully cast-in-place decks. Full-depth prefabricated bridge decks also facilitate construction; bridge designers are finding innovative ways to connect full-depth panels.

Full-depth deck panels for the George Washington Parkway in McLean, VA

Total Prefabricated Bridge Systems

Total prefabricated bridge systems offer maximum advantages for rapid construction and depend on a range of prefabricated bridge elements that are transported to the work site and assembled in a rapid-construction process.

Benefits

- Increased work zone safety.
- Improved constructability.
- Lowered life-cycle costs.
- Increased quality through controlled fabrication conditions.

Successful Applications: Prefabrication benefits States

The Washington Department of Transportation (DOT) recently minimized traffic disruption on the U.S. Interstate 5 (I-5) /South 38th Street interchange in Tacoma, WA, by using partial-depth precast concrete deck panels.

When the Virginia DOT needed to keep I-95 open during the James River Bridge replacement, the State used a prefabricated superstructure system for most of the bridge spans. The composite units consisted of a 222 mm concrete deck over steel girders that were fabricated at a nearby casting yard. Crews were able to cut the old bridge spans into segments and remove them, prepare the gaps for the new composite unit, and then set the new unit in place in an overnight operation.

Ongoing research is focused on identifying and developing new bridge elements and systems for all materials that would help accelerate bridge construction.

Additional Resources

Visit the American Association of State Highway and Transportation Officials' Technology Implementation Group (TIG) Web site at **www.aashtotig.org** for more information on prefabricated bridge elements and systems or to learn about the TIG Implementation Panel on Prefabricated Bridge Elements and Systems' activities.

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